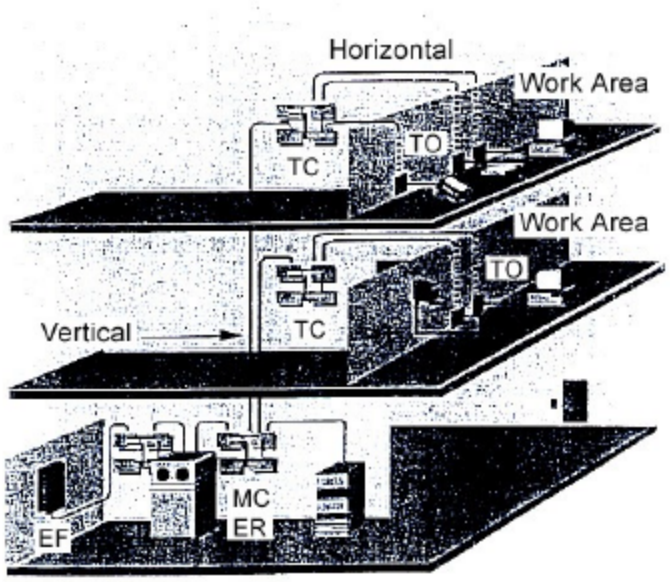
OVERVIEW / INTENT

The City of Bedford is constructing a Municipal Complex to be located on Warrensville Center Road in Bedford, Ohio. At this location, The City of Bedford is planning to implement a "Structured Cabling System", which will herein be referred to as the SCS, for the purpose of integrating voice, data, video and low voltage signals onto a common distribution platform. An example of an SCS is depicted in the drawing below:

25 Year Extended Product Warranty and
Applications Assurance Warranty

TC = Telecommunications Closet
TO = Telecommunications Outlet
MC = Main Cross-Connect
ER = Equipment Room
EF = Entrance Facility



Common Structured Cabling System

1.1. WORK AREA SUBSYSTEM

The Work Area subsystem provides the connection between the TO and the station equipment. In the Work Area, TO are located and terminated on the end of the horizontal cable that provides modular connectivity to a single point device. The Work Area subsystem consists of patch cables and/or adapters. The SCS contractor shall provide and install this interface where required and/or directed.

It shall be the responsibility of the SCSW contractor to properly terminate all horizontal cables at the device.

1.2. HORIZONTAL SUBSYSTEM

The Horizontal Subsystem provides connections from the horizontal cross connect to the information outlets in the work areas. It consists of the telecommunications outlets in the work area, horizontal transmission media, cross-connect hardware, jumpers and patch cables in the wiring closets. All cabling will be tested by the SCS contractor from the TC to the TO. All horizontal cabling provided by the SCS contractor shall consist of 24-AWG unshielded twisted pair and be wired in a star configuration from the TC to the TO locations. All horizontal cabling shall be plenum rated. Any exceptions to the use of this cabling by the SCS contractor must a) be proven electrically incompatible, or b) in violation of local codes or standards, and be documented in writing by the contractor. It is imperative that the SCS be designed to create a fully operational system without any restrictions, and provide maximum flexibility for future use. For this reason, it is the City of Bedford's preference to utilize power-limited low voltage cabling and devices whenever possible, unless it is technically or economically impractical.

The entire Fire Department building will be served by Telecommunications Closet *#4* (Room Fl19) located in the Fire Department. The entire City Hall building will be served by Telecommunications Closet #3 (Room C132A) located in the City Hall. The upper level of the Justice Center will be served by Telecommunications Closet #2 (Room 201A), located on the second floor. The basement level and the area designated as Police Department (excluding the detention facility) on the main level will be served by Telecommunications Closet #1 (Room P131) located on the main level in the Police Department. The remainder of the Justice Center including the Detention Facility will be served by the Main Computer Room (Room J112) located on the main level of the Justice Facility.

The SCS contractor shall provide and install all modular cords required in the MC and TC.

It is the responsibility of the SCS contractor to ensure that any necessary cable support materials and pathways (conduit, cable tray, raceway, cable rings, etc.) required to support the horizontal cabling is to be provided and installed.

1.3. VERTICAL SUBSYSTEM

The main cable route within a building is called the Vertical Subsystem. It links the main cross connect (MC) to the horizontal cross connects in the telecommunications closets (TC) and/or other special purpose rooms. It consists of the vertical transmission media between these locations, cross-connect hardware, jumpers and patch cables in the wiring closets. It is normally installed in a star topology, with first-level vertical cables beginning at the main cross connect. All vertical cabling shall be tested by the SCS contractor. Multi-pair copper vertical

cabling shall be supplied and installed by the SCS contractor and shall provide connectivity from the MC to the TC and the Phone Room. Multi-mode and single-mode fiber optic vertical cabling will also be supplied and installed by the SCS contractor (except where noted) and shall provide connectivity from the MC to the TC. All vertical (indoor) cabling shall be plenum rated. Any exceptions to the use of this cabling by the SCS contractor must a) be proven electrically incompatible, or b) in violation of local codes or standards, and be documented in writing by the contractor. It is imperative that the SCS be designed to create a fully operational system without any restrictions, and provide maximum flexibility for future use. For this reason, it is the City of Bedford's preference to utilize power-limited low voltage cabling and devices whenever possible, unless it is technically or economically impractical.

The SCS contractor shall provide and install all modular cords required in the MC and TC.

1.4. EQUIPMENT SUBSYSTEM

The Equipment Subsystem consists of shared (common) communications equipment in the main cross-connect, equipment room or telecommunications closet. The Equipment Subsystem provides miscellaneous equipment and/or devices. It allows other equipment to be installed with a distributed or centralized approach. In addition, it allows for equipment to be easily replaced or upgraded in the future. The equipment is to be provided and installed by the SCS contractor. The SCS contractor shall work in cooperation with other vendors to verify exact placement of all equipment before the installation of the equipment. The layout and designation of the equipment is to be mutually agreed upon by the SCS contractor and other related contractors. Final approval for the layout and designation of the equipment shall reside with the City of Bedford and/or the Project Manager.

1.5. ADMINISTRATION SUBSYSTEM

The Administration Subsystem links all of the subsystems together. It consists of labeling cabling, hardware, and equipment for providing system identification. The administration subsystem shall consist of labels, plates, and other identification materials. All labeling schemes shall be approved by the City of Bedford prior to installation. All components required for the Administration Subsystem shall be provided and installed by the SCS contractor. All cable path and cross connect engineering/records required to document electrical continuity shall be provided by the SCS contractor, and shall be subject to approval by the City of Bedford. In addition, all labeling for the pathways, cables, cross-connect blocks, and outlets are to be provided and installed by the SCS contractor. All labeling shall be in accordance with TIA/EIA-606 Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.

1.6. ENGINEERING & PROJECT MANAGEMENT

As previously stated, it shall be the responsibility of the S CS contractor to ensure all cable path engineering for the SCS installation. Additional engineering, diagrams, records, and project management shall be provided by the SCS contractor as stated in other sections of this specification.

1.7. SPECIAL REQUIREMENTS

Training for all subsystems shall be provided by the SCS contractor as stated in other sections of this specification.

1.8. SCS SCOPE OF WORK OVERVIEW

The following items are displayed as a general overview. Exact specifications can be found in the appropriate sections.

DESCRIPTION OF WORK

A. WORK AREA SUBSYSTEM

1- Provide Work Area patch cable
2- Install Work Area patch cable

B. HORIZONTAL SUBSYSTEM

1- Provide Work Area outlet
2- Install Work Area outlet
3- Provide Horizontal Cabling
4- Install Horizontal Cabling
5- Terminate Horizontal Cabling
6- Test Horizontal Cabling
7- Provide MC and TC1-4 patch cables
8- Install MC and TC1-4 patch cables

C. VERTICAL SUBSYSTEM

1- Provide Work Area outlet
2- Install Work Area outlet
3- Provide Horizontal Cabling
4- Install Horizontal Cabling
5- Terminate Horizontal Cabling
6- Test Horizontal Cabling
7- Provide MC and TC1-4 patch cables
8- Install MC and TC1-4 patch cables

D. EQUIPMENT SUBSYSTEM

1- Provide Work Area patch cable
2- Install Work Area patch cable

E. ADMINISTRATION SUBSYSTEM

1- Provide and place labels
2- Provide SCS as-built drawings
3- Provide cross-connect information/sheets
4- Provide test documentation

F. ENGINEERING AND PROJECT MANAGEMENT

1- Provide Project Management
2- Attend Project meetings
3- Provide Cable support engineering

G. SPECIAL REQUIREMENTS

1- Provide training on all subsystems
2- Provide Training documentation

2. TERMS AND CONDITIONS

2.1. BID RESPONSE

A. Responses to this RFP shall be submitted in sealed packages and accepted until May 23, 2002, 11:00 AM Eastern Standard Time.

Sealed responses must be submitted to:

City of Bedford
65 Columbus Road
Bedford, Ohio 44146
Attn: City Manager

2.2. ATTACHMENTS

The documents listed below are attached to and constitute an integral part of this RFP.

?? BID forms
?? Drawings E1.1, E2.1 through E2.5 as prepared for construction by Richard L. Bowen & Associates, (Architect Electrical Blueprints, drawings) may be obtained from Lakeside Blueprint, (216) 631-2620.

2.3. PRE-BID MEETING AND SITE VISIT

A mandatory Pre-bid meeting and site visit will be required.

May 1, 2002 10:00 AM Eastern Standard Time.

City of Bedford
65 Columbus Road
Bedford, OH 44146

2.4. CONTRACTOR REPRESENTATION

An SCS contractor, by submitting a proposal in response to the RFP, represents that:

A. The SCS contractor understands that all costs incurred by submitting an RFP response is to be consumed entirely by the SCS contractor.

B. The SCS contractor has read this RFP in its entirety and agrees to the terms, conditions, and qualifications set forth herein, except as identified and described in the SCS contractor's proposal.

C. The SCS contractor agrees to keep confidential all documents and information provided by the City of Bedford, and further agrees not to disclose such information to a third party, except with written permission from the City of Bedford.

D. The person whose signature appears on the SCS contractor's proposal has the power and authority to enter into a contract with the City of Bedford and that SCS contractor's proposal constitutes a valid and binding obligation.

E. The SCS contractor has attended the mandatory pre-bid meeting, has visited the site, and is familiar with the conditions under which the work is to be performed.

F. The SCS contractor guarantees that the prices provided in the SCS contractor's proposal have been established without collusion with other eligible SCS contractors and without effort to prevent the City of Bedford the lowest possible competitive price.

G. The SCS contractor's proposal meets all requirements specified in the RFP, except as identified and described in the SCS contractor's proposal.

H. The SCS contractor is duly licensed to operate by the proper State, or local body or agency required for this project.

2.5. ISSUING OFFICE

The office listed below officially issues this RFP:

City of Bedford
65 Columbus Road
Bedford, Ohio 44146
Robert Reid - City Manager
PHONE: 440.232.1600
FAX: 440.232.2510

All communications regarding this RFP must be directed, in writing, to the above as well as: The Project Coordinator, Bobbie Dulaney, Bedford Municipal Court, 65 Columbus Road, Bedford, Ohio 44146, FAX – 440.232.2510, E–MAIL: scsbid@bedfordmuni.org.

2.6. INQUIRIES

An SCS contractor requiring clarification or interpretation of the RFP shall make a written request to the issuing office. All such requests must be received by the issuing office at least five (5) business days prior to the RFP due date.

The City of Bedford will respond to all inquiries in writing. Any verbal statements regarding inquiries made by any persons prior to the award of a contract will be non-binding.

2.7. ADDENDA

Any changes or corrections to this RFP, including answers to all inquiries received from SCS contractors, will be made by written addenda. The addenda shall constitute the only official means of communicating interpretations, corrections or changes to this RFP, as well as the only official response to inquiries. Corrections or changes to this RFP made in any other manner will not be binding.

2.8. COMPLIANCE

Latest editions of the TIA/EIA 568-A, 569, 606, 607 standards and all applicable TSBs, as well as the most recent edition of the Building Industry Consulting Services International (BICSI) Telecommunications Distribution Methods Manual shall govern all work described in the SCS contractor's proposal.

2.9. FURNISH AND INSTALL

The SCS contractor's proposal shall include the cost of all materials and all labor necessary to install a fully functional SCS.

2.10. DRAWINGS

All drawings included as part of the RFP are provided for reference only. The SCS contractor is responsible for determining/verifying all distances, lengths, measurements, etc.

2.11. PROJECT MANAGEMENT

The SCS contractor shall assign a (non-working/management only) project manager to this project and is to be present throughout the entire project. The project manager shall be responsible, have the experience and authority to make on-site decisions and act as immediate liaison to the City of Bedford and the Project Manager.

In addition, the SCS contractor shall comply with all project progress reporting requirements specified by the City of Bedford and/or the Project Manager.

2.12. APPROVAL AND REJECTION

All materials furnished by the successful SCS contractor are subject to inspection and approval by the City of Bedford and the Project Manager. Any rejection of materials resulting because of non-conformity to the terms, conditions, and specifications of this RFP, shall be at the SCS contractor's risk and expense.

2.13. WORK COMPLETION SCHEDULE

All work quoted by the SCS contractor's proposal must be completed by the date(s) specified by the City of Bedford and/or the Project Manager. The SCS contractor must work in a timely fashion along with all other trades to complete the project. At the time of this RFP, a work completion schedule has not been published.

2.14. PREPARATION OF PROPOSALS

The SCS contractor's proposal shall be prepared as identified below. Failure to do so will result in the disqualification of the proposal. The proposal shall be prepared and submitted in a three ring binder and shall be in the following format:

Section Tab	Item Tab	Contents
Bid Forms		
	Bid Invitation	Bid Invitation Page
	Instructions	Instructions to bidders
	Notice to Bidders	Notice to Bidders
	Terms and Conditions	General Terms and Conditions
	Specifications	Addenda to the Specifications
	Proposal	Proposal
	Affidavit	Affidavit
Bonds/Permits		
	Bid Bond	Bid Bond
	Perf. Bond	Performance Bond
	Misc. Permits	Miscellaneous required permits
Proposal Overview		
	Overview	Detailed description of the proposed installation
Project Plan		
	Plan	Detailed project plan of the proposed installation
Contractor Qualifications		
	References	References
	Resume	Project manager resume
	Electrical Lic.	Electrical Contractor License
	PLUS	Ortronics Certified Installer PLUS certificate
	BRIC	Belden BRIC certificate
	RCDD	BICSI RCDD certificate
	Insurance	Proof of Insurance
	Workers Comp.	Proof of Worker's compensation
Submittals		
	Data	Product Data
	Instructions	Manufacturer's instructions
	Warranty	Manufacturer's warranty information
Miscellaneous		
	Miscellaneous	Any other pertinent information

2.15. DELIVERY & RECEIPT OF PROPOSALS

Two (2) complete copies of the SCS contractor's proposal and all supporting materials shall be delivered to the Issuing Office no later than the time and date specified. Any proposal received after the time and date specified shall be considered non-responsive.

The proposal must be sealed, addressed and delivered to the Issuing Office. The package containing the proposal must be clearly labeled "SCS RFP RESPONSE ENCLOSED".

All costs for developing and delivering the responses to this RFP shall be borne solely by the SCS contractor.

The City of Bedford reserves the right to reject any and all proposals.

The SCS contractor's proposal shall constitute an offer binding the contractor for ninety (90) calendar days following the RFP date.

All materials submitted in response to this RFP become the property of the City of Bedford upon delivery to the Issuing Office.

2.16. WORK SCHEDULE

Working hours shall be as directed by the Project Manager.

2.17. SITE STORAGE

The SCS contractor shall provide his own storage as necessary.

2.18. SUB-CONTRACTING

Sub-contracting or temporary workers WILL NOT be permitted within the scope of this RFP. The SCS contractor shall use currently employed personnel for the entire requirement of this RFP.

2.19. SMOKING POLICY

The SCS contractor's employees shall comply with the project site smoking policy as dictated by the Project Manager.

2.20. PREVAILING WAGE

This project has been designated as a telecommunications prevailing wage project. It is the responsibility of the SCS contractor to understand and comply with this requirement as mandated by the respective agencies.

2.21. PERMITS

The SCS contractor shall be responsible for all required permits, federal, state, local or others, that apply to this RFP. Local permit fees will be waived upon registration with the city, subsequent to bid award and prior to start.

2.22. SUBMITTALS

A. Product Data

Provide manufacturer's catalog information showing dimensions, colors, and configurations.

B. Manufacturer's Instructions

1. Indicate application conditions and limitations of use stipulated by product testing agency specified under regulatory requirements. Include instructions for storage, handling, protection, examination, preparation, operation and installation of product.

2. A technical data sheet from the manufacturer should be included with the response for each product proposed. This data sheet shall include the physical specifications as well as the electrical and transmission characteristics.

C. Manufacturer's Warranty

1. Complete documentation regarding the manufacturers warranty shall be submitted as part of the proposal. This shall include, but is not limited to: a sample of the warranty that would be provided to the customer when the installation is complete and documentation of the support procedure.

2.23. CONTRACTOR QUALIFICATIONS

Letters and/or certificates shall be submitted for the following criteria:

A. SCS Contractor Selection

The SCS contractor selected for this Project must adhere to the engineering, installation and testing procedures and utilize the authorized manufacturer components and distribution channels in provisioning this Project.

B. SCS Contractor Experience and Training

The SCS contractor shall be experienced (at least 5 years) in all aspects of this work and shall be required to demonstrate direct experience on recent systems of similar type and size. The contractor shall own and maintain tools and equipment necessary for successful installation and testing of optical and copper SCS and have personnel who are adequately trained in the use of such tools and equipment.

C. SCS Contractor Detailed Qualifications

- ?? A list of recently completed projects of similar type and size with contact names and telephone numbers for each.
- ?? A technical resume of experience for the SCS contractor's on-site Project Manager who will be assigned to this project.
- ?? SCS contractor must be a licensed electrical contractor.
- ?? SCS contractor must be an Ortronics Certified Installer PLUS.
- ?? SCS contractor must be a Certified Berk-Tek Oasis Integrator.
- ?? SCS contractor must be a Corning LANscape EWP Installer.
- ?? SCS contractor must have a BICSI RCDD.
- ?? SCS contractor must provide proof of insurance limits.
- ?? SCS contractor must provide proof of current payments of workers compensation premiums.
- ?? SCS contractor must provide a bid bond for this project.
- ?? SCS contractor must provide a 100% performance bond for this project.
- ?? SCS contractor must provide a non-collusion affidavit.
- ?? SCS contractor must provide a current tax certificate form.

2.24. WARRANTY

A Berk-Tek / Ortronics / Corning EWP twenty-five (25) year Extended Product Warranty and System Assurance Warranty for this wiring system shall be provided.

A. 25-Year Extended Product Warranty and Applications Assurance Warranty

Berk-Tek, Ortronics, and Corning Structured Cabling Products, when installed by an Oasis Installer, Certified Installer PLUS, and Corning LANscape EWP Installer (respectively) and used in a Structured Cable

System in accordance with the terms and conditions specified in the Certified Installer PLUS Program outlined herein:

- Will be free from defects in material and workmanship for a period of twenty-five (25) years from the date of installation registration by the Oasis Installer, Certified Installer PLUS and LANscape EWP Installer; and

- Will support any current or future applications which are designed for data transmission over the 100 MHz link/channel, as defined in TIA/EIA-568A Telecommunications Standard, for a period of twenty-five *(25)* years from the date of installation registration by the Oasis Installer, Certified Installer PLUS and LANscape EWP Installer.

B. System Certification

Upon successful completion of the installation and subsequent inspection, the customer shall be provided with a numbered certificate, from the manufacturing company, registering the installation.

3. GENERAL INFORMATION

3.1. REFERENCES

?? TIA/EJA-568A Commercial Building Telecommunications Cabling Standard.
?? TIA/EIA-569A Commercial Building Standard for Telecommunications Pathways and Spaces.
?? TIA/EIA-606 Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
?? TIA/EIA-607 Commercial Building Grounding and Bonding Requirements for Telecommunications
?? TIA/EIA TSB67 Transmission Performance Specifications for field-testing of Unshielded Twisted-pair Cabling Systems.
?? TIA/EIA TSB72 Centralized Optical Cabling Guidelines.
?? TIA/EIA TSB75 Additional Horizontal Cabling Practices for Open Offices.
?? International Standards Organization/International Electrotechnical Commission (ISO/IEC) DIS 11801, January 6, 1994.
?? Underwriters Laboratories (UL®).
?? National Electrical Manufacturers Association (NEMA)
?? American Society for Testing and Materials (ASTM)
?? National Electrical Code (NEC)
?? National Fire Protection Association (NFPA)
?? Institute of Electrical and Electronic Engineers (IEEE)
?? American National Standards Institute (ANSI)

3.2. DEFINITION . STRUCTURED CABLING SYSTEM

SCS wiring is defined as all required equipment and cabling including hardware, termination block, termination, jacks, and data cable installed and configured to provide computer data and voice connectivity from each data or voice outlet to the network file server or voice network/switch designated as the service point of the local area network.

3.3. BASIC CABLING REQUIREMENTS

A. Cable Pathway

Extension of all data and voice cable shall be within raceway, conduit, cable tray or other designated cable support system provided and installed by the SCS contractor where concealed in walls and exposed above ceiling spaces.

B. Hardware

Required hardware includes, but is not limited to, termination blocks, fastening devices, data outlets, voice outlets and all required accessories to comply with this specification.

3.4. GROUNDING AND BONDING

The SCS contractor shall provide a #6 AWG stranded copper wire cable between ground bars which are to be located at the MC, TC1-4 and the building main service ground point. This ground conductor shall be utilized for equipment, termination, equipment rack and computer equipment grounding.

A. Bonding and Grounding

Communication bonding and grounding shall be in accordance with the NEC®, NFPA and the TIA/EIA - 607 Commercial Building Grounding and Bonding Requirements for Telecommunications.

3.5. DESCRIPTION

A. Structured Cabling System

Furnish and install complete with all accessories a SCS. The SCS shall serve as a vehicle transport of data, video and voice telephony signals throughout the network from designated demarcation points to outlets located at various desks, workstation and other locations as indicated on the provided drawings and/or described herein.

B. Telephone Company Connectivity

Wiring utilized for Telephone Company central office voice service shall originate at a demarcation point, the cross-connect provided by the telephone company. Installation, termination and identification of wiring between station outlets, TCs and the Telephone room to provide final connection to phone equipment shall be considered part of the SCS contractor's work. The SCS contractor shall work with the phone vendor to complete voice connections.

C. Data and Voice

Wiring utilized for data and voice communications shall originate at owner provided hubs and concentrators in vertical free standing equipment racks located at the Telecommunications Equipment Room (ER), the Main Cross-connect (MC), and the Telecommunications Closet (TC) locations. Wiring, terminations and patch panels between these designated demarcation points and outlet locations designated on the plans/matrix shall be considered part of the SCS contractor's work. Outlet (jacks) shall be furnished, wired and installed by the SCS contractor.

3.6. SPECIAL REQUIREMENTS FOR CABLE ROUTING AND INSTALLATION

A. Cabling

All communications cabling used throughout this project shall comply with the requirements as outlined in the National Electric Code (NEC) Articles 725, 760, 770, and 800 and the appropriate local codes. All cabling shall be and shall bear CMP (Plenum Rated).

B. Cable Pathway

In suspended ceiling and raised floor areas where duct, cable trays or conduit are not available, the SCS contractor shall bundle, in bundles of 50 or less, station wiring with plenum cable ties snug, but not deforming the cable geometry. The cable bundling shall be supported via cable rings attached to the existing building structure and framework at a maximum of five (5) foot intervals. Plenum rated cable will be used in all areas. The SCS contractor shall adhere to the manufacturers' requirements for bending radius and pulling tension of all cables.

C. Fire Stopping

Sealing of openings between floors, through rated fire and smoke walls, existing or created by the SCS contractor for cable pass through shall be the responsibility of the SCS contractor. Sealing material and application of this material shall be accomplished in such a manner, which is acceptable to the local fire and building authorities having jurisdiction over this work. Creation of such openings shall be the responsibility of the SCS contractor. ANY and ALL openings created by or for the SCS contractor, and used or left unused shall also be sealed as part of this work.

D. SCS contractor Responsibility

The SCS contractor shall be responsible for any and all damage as a result of his work. Repair of such damage shall be handled expeditiously and at the SCS contractor's expense.

3.7. SYSTEM DESCRIPTION

The system shall utilize a network of fiber optic, and unshielded twisted pair, riser, tie and station cables. Cables and terminations shall be provided and located as shown and in the quantities indicated on the drawings and/or matrix. Fiber cables shall terminate on fiber patch panels located in all demarcation and termination points shown on the drawings. All cables and terminations shall be identified at all locations. All copper cable terminations shall comply with, and be tested to TIA/EIA 568A and TSB-67 standard for Category 5 installations. Unused pairs between the Telephone Room, MC and TC(s) shall be saved and identified as spare at each location. Station cables shall terminate on one gang wall plates, modular furniture bezels, surface mount boxes, or other as needed or directed.

4. TECHNICAL SPECIFICATIONS & PRODUCTS

4.1. EQUIVALENT PRODUCTS

Equivalent product(s) of a different manufacture MAY be considered for substitution for those products specified; providing the equivalent products meet or exceed the manufactures warranties and technical specifications stated in this RFP. This project has been designed for the customer preference of an Anixter Level 6 Solution utilizing an Ortonics, Berk-Tek solution.

4.2. SCS SYSTEM PRODUCTS

The SCS contractor shall use the products specified in this section.

Product color may vary then as specified.

- Miscellaneous supporting hardware and structure products are not specified, such as rings, clamps, flexible non-metallic tubing, miscellaneous hardware, etc.
- It is the SCS contractor's responsibility to verify product and installation compatibility.
- It is the SCS contractor's responsibility to ensure, supply and install all quantities and components for a fully functional SCS.
- The SCS must include all products end-to-end to complete the system, including equipment and station patch cables installed.
- Some cable terminations may be on walls, within floor boxes, or in furniture partitions.

- The SCS contractor shall verify exact placement of all terminations with the City of Bedford and/or the Project Manager.
- Any needed miscellaneous materials and hardware to complete connections from floor boxes to furniture partitions will be supplied and installed by the SCS contractor.

A. WORK AREA SUBSYSTEM

PRODUCT	DESCRIPTION	MFR	PART #
Jack Module	GIGAMO+ TracJack Modules Level 6	Ortronics	OR-63760001-13
Patch Cable Blue	NetCLEAR GIGAMO Level 6 7 Ft.	Ortronics	OR-836GTP07DEBU
Patch Cable Green	NetCLEAR GIGAMO Level 6 7 Ft.	Ortronics	OR-836GTP07DEGR
Patch Cable Blue	NetCLEAR GIGAMO Level 6 9 Ft.	Ortronics	OR-836GTP09DEBU
Patch Cable Green	NetCLEAR GIGAMO Level 6 9 Ft.	Ortronics	OR-836GTP09DEGR

B. HORIZONTAL SUBSYSTEM

PRODUCT	DESCRIPTION	MFR	PART #
Cat 5e Cable for Data Drops Blue	LANmark-350 Level 6 Cable Plenum (1000' reels)	Berk-Tec	230645
Cat 5e Cable for Voice Drops Violet	LANmark-350 Level 6 Cable Plenum (1000' reels)	Berk-Tec	230709
Patch Cable Blue	NetCLEAR GIGAMO Level 6 3 Ft.	Ortronics	OR-836GTP03DEBU
Patch Cable Green	NetCLEAR GIGAMO Level 6 3 Ft.	Ortronics	OR-836GTP03DEGR
Patch Cable Blue	NetCLEAR GIGAMO Level 6 5 Ft.	Ortronics	OR-836GTP05DEBU
Patch Cable Green	NetCLEAR GIGAMO Level 6 5 Ft.	Ortronics	OR-836GTP05DEGR
Patch Cable Blue	NetCLEAR GIGAMO Level 6 7 Ft.	Ortronics	OR-836GTP07DEBU
Patch Cable Green	NetCLEAR GIGAMO Level 6 7 Ft.	Ortronics	OR-836GTP07DEGR
Patch Cable Blue	NetCLEAR GIGAMO Level 6 9 Ft.	Ortronics	OR-836GTP09DEBU
Patch Cable Green	NetCLEAR GIGAMO Level 6 9 Ft.	Ortronics	OR-836GTP09DEGR
96 Port Patch Panel	Modular to 110 Patch Panels PCB Version Level 6 T568A	Ortronics	OR-851000354
48 Port Patch Panel	Modular to 110 Patch Panels PCB Version Level 6 T568A	Ortronics	OR-851000334
Fiber Patch Panel Chassis	Rack Mount 12 Fiber Capacity		
Fiber Panel Module	FIBER OPTIC PANEL 6 PACK W/3 DUPLEX SC ADAPTER		
Fiber patch cables	Fiber Patch Cable SC-SC 2 m		
Horizontal Cable Management	7 Ring Hinged Cover Cable Management 3.5Hx19Wx3.5D		
Vertical Cable management	Vertical Cable Management Ring		
Rack	84" Rack		

C. VERTICAL SUBSYSTEM

PRODUCT	DESCRIPTION	MFR	PART #
Fiber Cable	12 Strand Multi-Mode Plenum Grade Ribbon Cable	Corning	012CC8-14131-20

D. EQUIPMENT SUBSYSTEM

PRODUCT	DESCRIPTION	MFR	PART #
Patch Cable Blue	NetCLEAR GIGAMO Level 6 3 Ft.	Ortronics	OR-836GTP03DEBU
Patch Cable Green	NetCLEAR GIGAMO Level 6 3 Ft.	Ortronics	OR-836GTP03DEGR
Patch Cable Blue	NetCLEAR GIGAMO Level 6 5 Ft.	Ortronics	OR-836GTP05DEBU
Patch Cable Green	NetCLEAR GIGAMO Level 6 5 Ft.	Ortronics	OR-836GTP05DEGR
Patch Cable Blue	NetCLEAR GIGAMO Level 6 7 Ft.	Ortronics	OR-836GTP07DEBU
Patch Cable Green	NetCLEAR GIGAMO Level 6 7 Ft.	Ortronics	OR-836GTP07DEGR
96 Port Patch Panel	Modular to 110 Patch Panels PCB Version Level 6 T568A	Ortronics	OR-851000354
48 Port Patch Panel	Modular to 110 Patch Panels PCB Version Level 6 T568A	Ortronics	OR-851000334
96 Port Patch Panel	Modular to 110 Patch Panels PCB Version Level 6 T568A	Ortronics	OR-851000354
48 Port Patch Panel	Modular to 110 Patch Panels PCB Version Level 6 T568A	Ortronics	OR-851000334
Fiber Patch Panel Chassis	Fiber Adapter Panels SC Duplex (6-Adapter)	Corning	
Fiber Panel Module	FIBER OPTIC PANEL SIX PACK W/6 ST ADAPTER	Corning	
Fiber Panel Module	FIBER OPTIC PANEL 6 PACK W/3 DUPLEX SC ADAPTER	Corning	
Fiber patch cables	Fiber Patch Cable SC-SC 2 m		
Fiber patch cables	Fiber Patch Cable ST-SC 2 m		
Horizontal Cable Management	5+ Ring Cable Management 3.5Hx19Wx3.5D		
Vertical Cable management	Vertical Cable Management Ring		
Rack	84" Rack		

4.3. UNSPECIFIED EQUIPMENT AND MATERIAL

Any item, of equipment or material not specifically addressed on the drawings or in this document and, required to provide a complete and functional SCS installation shall be provided in a level of quality consistent with other specified items.

4.4. GROUNDING SYSTEM AND CONDUCTORS

The SCS contractor shall provide a #6 AWG stranded copper wire cable between ground bars which are to be located at the MC, TC 1-4 and the building main service ground point. This ground conductor shall be utilized for equipment, termination, equipment rack and computer equipment grounding.

A. Bonding and Grounding

Communication bonding and grounding shall be in accordance with the NEC®, NFPA and the TIA/EIA-607 Commercial Building Grounding and Bonding Requirements for Telecommunications

The SCS contractor is responsible for providing and installing all components required for a complete grounding system.

4.5. APPROVED UTP CABLE PERFORMANCE

4.5.1. Scope

This specification applies to solid 4-pair unshielded twisted-pair (UTP) communications cables and stranded patch cordage, NEC types CM, CMG, CMR, CMP, MP, MPG, MPR and MPP, and where applicable, CSA FT-4 and FT-6. Zero Halogen constructions are also included.

4.5.2. Normative References

4.5.2.1. Reference Documents

The latest edition of referenced standards (from the latest available draft in the case of proposed standards) shall be the controlling document. Where the standards appear to conflict with one another, the one with the most stringent requirements shall be applicable.

?? ANSI/ICEA S-90-661
?? CSA
?? UL 444
?? ANSI/TIA/EIA-568-A
?? ISO/IEC 11801
?? CENELEC EN50173: 1995

?? NEC, NFPA70
?? NEMA WC-63/66

4.5.3. Applicable Testing Standards

Testing shall be in accordance with the following standards:

?? ASTM D 4566-94, Standard Test Method for Electrical Performance Properties of Insulation and Jackets for Telecommunications Wire and Cable, 1994
?? ANSI/TIAIEL4-568-A, Commercial Building Telecommunications Standard, 1995
?? ANSI/TIA/EIA-568-A-l, Propagation Delay and Delay Skew Specifications for 100 O 4-pair cable, 1997
?? ANSI/TIA/EIA-568-A-2, Corrections and Additions to TIA/EIA-568-A. 1998
?? ANSI/TIA/EIA-568-A-5, Transmission Performance Specifications for 4-pair 100 O Category 5e Cabling, 1999

This document provides required test values at specific discrete frequencies. The tabulated values are intended for reference only. All Levels products are swept-tested through a prescribed frequency range. The Anixter Levels purchase specification requires 100% compliance throughout the specified range of frequencies tested. By convention, all values of electrical characteristics, while predominantly negative numbers (representing losses), are expressed as absolute values (positive numbers).

4.6. General Requirements

4.6.1. Applicable Cables

Levels of performance apply to 4 pair unshielded twisted pair cables, manufactured by Berk-Tek. A shielded version, if allowed, shall comply with the performance requirements of the applicable Level.

4.6.2. Minimum Performance Requirements

All Berk-Tek cables shall meet the minimum performance requirements of the latest applicable standards defined above.

4.6.3. Minimum Levels Requirements

Berk-Tek cable for each purchasing Level shall meet the performance requirements of all lower Levels.

4.6.4. Virgin Materials

Only Virgin materials shall be used in the construction of Levels cables.

4.6.5. Plenum Rated Cables

Berk-Tek plenum-rated cables shall use 100% FEP for the insulation except

where it is proven that the cable constructed with alternate materials meets or exceeds the electrical performance of FEP.

4.6.6. Quality Assurance

Berk-Tek, the manufacturer of Level 6 cables specified herein, shall be ISO 9000 registered.
Initial Qualification and Certification of the manufacturer is required. An ongoing program of random sample compliance testing of all Levels products must be maintained.

4.6.7. Labeling of UTP Cable and Patch Cordage

The following information will be repetitively printed every 12-24 inches on the cable jacket:
Berk-Tek's name, brand, gauge, pair count, NEC type (CSA in Canada), part number, other standards compliance rating, and footage marker.

4.6.8. Packaging of UTP Cable

Standard packaging is 1,000 feet, one continuous length on a reel, in a reel-less box or on a reel in a box. All cables shall be shipped to on 42" x 48" pallets, and shall not be stacked higher than 48". All pallets shall contain the same color cable with the same footage marked with the appropriate part number.

4.6.9. Measurement Precautions

Transmission measurements shall be performed on 100m (328 ft.) cable samples cut from the reel or package. Impedance matching balun terminations shall be used in conjunction with an RF vector network analyzer to acquire all data. When preparing the cable samples for measurement, no more than 38 mm (1.5 in.) of jacket shall be removed on either end of the sample. The twist rate shall be maintained as much as possible into the balun test terminals. When a load termination is required, a precision metal film or chip 100 O ± 1% resistor shall be used to terminate each cable pair.

4.7. Level Six (6) Cable

4.7.1. Reference Documents

In addition to the requirements listed above and below, Berk-Tek Level 6 cables shall meet the requirements of:

?? ANSI/TIA/EIA-568-A-5 (Category 5e)
?? ANSI/TIA/EIA-568-A (Category 5)
?? ISO/IEC 11801 (Category 5)

4.8. Performance Requirements

4.8.1. Level 6 Cable - Highest Test Frequency

350 MHz minimum (all parameters)

4.8.2. Level 6 Cable - Input Impedance

Input impedance shall be measured per ASTM *4566-94*, 43.2 Method 2, Option 2. Level 6 input impedance shall be swept out to 350 MHz and meet the following:

FREQUENCY (MHz)	UPPER INPUT LIMIT (Ohms)	LOWER INPUT IMPEDANCE LIMIT (Ohms)
1	122	82
10	111	90
20	111	90
250	132	76

The above limits describe the boundaries of an envelope within which the swept curve must fit.

4.8.3. Level 6 Cable - Minimum Pair-to-Pair NEXT and ELFEXT

Pair-to-Pair Near End Crosstalk (NEXT) shall not be less than the minimum numbers shown in the following table. Pair-to-Pair Equal Level Far End Crosstalk (ELFEXT) shall not be less than the minimum numbers shown in the following table.

FREQUENCY (MHz)	PAIR-TO-PAIR NEXT LOSS (dB)	PAIR-TO-PAIR ELFEXT LOSS (dB)
1	67.3	66.8
10	52.3	46.8
20	47.8	40.7
31.25	44.9	36.9
100	37.3	26.8
200	32.8	20.7
250	31.3	18.8

4.8.4. Level 6 Cable - Minimum Power Sum NEXT and ELFEXT

Power Sum Near End Crosstalk (PSNEXT) shall not be less than the minimum numbers shown in the following table. Power Sum Equal Level Far End Crosstalk (PSELFEXT) shall not be less than the minimum numbers shown in the following table.

FREQUENCY (MHz)	POWER SUM NEXT LOSS (dB)	POWER SUM ELFEXT LOSS (dB)
1	64.3	63.8
10	49.3	43.8
20	44.8	37.7
31.25	41.9	33.9
100	34.3	23.8
200	29.8	17.7
250	28.3	15.8

4.8.5. Level 6 Cable - Maximum Attenuation, Minimum Pair-to-Pair ACR and Power Sum ACR

Attenuation shall not be greater than the maximum numbers shown in the following table when measured at an ambient temperature of 20^0C (68^0F). Pair-to-Pair Attenuation to Crosstalk Ratio (ACR) shall not be less than the minimum numbers shown in the following table. Power Sum Attenuation to Crosstalk Ratio shall not be less than the minimum numbers shown in the following table.

FREQUENCY (MHz)	ATTENUATION (dB)*	PAIR-TO-PAIR ACR (dB)	POWER SUM ACR (dB)
1	2.0	65.3	62.3
10	6.5	45.8	42.8
20	9.3	38.5	35.5
31.25	11.7	33.2	30.2
100	22.0	15.3	12.3
200	32.4	0.4	-2.6
250	36.9	-5.5	-8.5

**Attenuation for Level 6 stranded patch cordage is allowed to be up to 20% greater.*

4.8.6. Level 6 Cable - Minimum Return Loss (at 100 meters)

FREQUENCY (MHz)	RETURN LOSS (dB)
1	20.0
10	25.0
20	25.0
31.25	23.6
100	20.1
200	18.0
250	17.3

4.8.7. Level 6 Cable - Longitudinal Conversion Loss (LCL)

(Reserved for future use when the proper test procedure is developed by ASTM.)

4.8.8. Level 6 Cable - Maximum Skew

25 ns at 100 meters

4.8.9. Level 6 Cable - Maximum Attenuation

44.9 dB@350 MHz

4.9. APPROVED PATCH CORD PERFORMANCE

4.9.1. Scope

This section applies to 100 ohm stranded 4-pair UTP patch cordage in various lengths terminated with eight conductor modular RJ45 or IDC type plugs.

4.10. Normative References

4.10.1. Reference Documents

The latest edition of referenced standards (from the latest available draft in the case of proposed standards) shall be the controlling document. Where the standards appear to conflict with one another, the one with the most stringent requirements shall be applicable.

?? CSA
?? UL 1863
?? ANSI/TAI/EIA-568-A
?? ISO/IEC 11801
?? ISO/IEC 60603-7

4.10.2. Applicable Testing Standards

Testing shall be conducted in accordance with the following standards:

?? ANSI/TIA/EIA-568-A, Commercial Building Telecommunications Standard, 1995
?? ANSI/TIA/EIA-568-A-4, Production Modular NEXT Loss Test Method and Requirements for Unshielded Twisted Pair Cabling, 1999
?? ATS Anixter Test Specification ATS 01.01 for Non-Destructive Testing of Assembled Patch Cords

This document provides required test values at specific discrete frequencies. The tabulated values are intended for reference only. All Levels products are swept-tested through a prescribed frequency range. The Anixter Levels purchase specification requires 100% compliance throughout the specified range of frequencies tested. By convention, all values of electrical characteristics, while predominantly negative numbers (representing losses), are expressed as absolute values (positive numbers).

4.11. General Requirements

4.11.1. Applicable Hardware

Levels of performance apply to Ortronics patch cords used with 100 ohm, 4 pair Unshielded UTP Cabling Systems. A shielded version, if offered, shall comply with the performance requirement of the applicable level.

4.11.2. Quality Assurance

Ortronics, the manufacturer of Level hardware specified herein, shall be ISO 9000 registered. Initial Qualification and Certification of the manufacturer is required. An ongoing program of random sample compliance testing of all Levels products must be maintained.

4.11.3. Labeling of Patch Cords

The following information will be repetitively printed every 12-24 inches on the cable jacket:

Manufacturer's name, brand, gauge, pair count, NEC type (CSA in Canada); part number, and other standards compliance ratings.

4.11.4. Measurement Precautions

Transmission testing shall be conducted on representative samples of the manufacturer's shortest, median, and longest length cords received directly from Anixter's product inventory. The following tables provide reference numbers at specific discrete frequencies for 3 ft., 10 ft., and 25 ft. patch cords. The selected range of patch cord lengths is intended to provide baseline numbers for evaluating patch cord NEXT at varying lengths.

5. Level 6 Patch Cords

5.1. Performance Requirements

5.1.1. Level 6 Patch Cord - Highest Test Frequency

Swept to 150 MHz minimum.

5.1.2. Level 6 Patch Cord - Minimum Pair-to-Pair NEXT

Pair-to-Pair Near End Crosstalk (NEXT) shall not be less than the minimum numbers shown in the following table.

FREQUENCY (MHz)	PAIR-TO-PAIR NEXT LOSS 3 ft. cord Limit (dB)	PAIR-TO-PAIR NEXT LOSS 10 ft. cord Limit (dB)	PAIR-TO-PAIR NEXT LOSS 25 ft. cord Limit (dB)
1	65.0	65.0	65.0
10	57.7	56.9	55.7
20	51.8	51.1	50.0
31.25	47.9	47.3	46.3
100	38.1	37.7	37.2
150	34.7	34.4	34.1

5.1.3. Level 6 Patch Cord - Minimum Return Loss

Return Loss shall not be less than the minimum numbers shown in the following table.

FREQUENCY (MHz)	RETURN LOSS (dB)
1 to 20	25
31.25	23
100	18
155	16

6. APPROVED CONNECTING HARDWARE PERFORMANCE

6.1. Scope

This section applies to 100 ohm UTP connecting hardware.

6.2. Normative References

6.2.1. Reference Documents

Ortronics connecting hardware shall meet, as a minimum, all the requirements including the electrical and mechanical performance requirements of:

?? CSA
?? UL 1863
?? ANSI/TIA/EIA-568-A
?? ISO/IEC 11801
?? CENELEC EN50173: 1995
?? NEC, NFPA70

6.2.2. Applicable Testing Standards

Testing shall be conducted in accordance with the following standards:

?? AINSI/TIA/EIA-568-A, Commercial Building Telecommunications Standard, 1995 ANSI/TIA/EIA-568-A-5, Transmission Performance Specifications for 4-pair 100 O Category 5e Cabling, 1999
?? ISO/IEC 11801

This document provides required test values at specific discrete frequencies. The tabulated values are intended for reference only. All Levels products are swept-tested through a prescribed frequency range. The Anixter Levels purchase specification requires 100% compliance throughout the specified range of frequencies tested. By convention, all values of electrical characteristics, while predominantly negative numbers (representing losses), are expressed as absolute values (positive numbers).

6.3. General Requirements

6.3.1. Applicable Hardware

Levels of performance apply to Ortronics connecting hardware used with 100 ohm, 4 pair Unshielded UTP Levels Type Cables. A shielded version, if offered, shall comply with the performance requirement of the applicable level.

6.3.2. Quality Assurance

Ortronics, the manufacturer of Level hardware specified herein, shall be ISO 9000 registered. Initial Qualification and Certification of the manufacturer is required. An ongoing program of random sample compliance testing of all Levels products must be maintained.

6.3.3. Measurement Precautions

Transmission testing shall be conducted on representative samples received directly from Anixter's product inventory. The normative annexes C, D, E and F of the NSI/TIA/EIA-568-A-5 shall be adhered to when quantifying connecting hardware.

7. Level 6 Connecting Hardware

7.1. Level 6 Hardware - Performance Requirements

7.1.1. Level 6 Hardware - Highest Test Frequency

Swept to 155 MHz minimum.

7.1.2. Level 6 Hardware - Minimum Pair-to-Pair NEXT and Pair-to-Pair FEXT

Connector Pair-to-Pair Near End Crosstalk (NEXT) shall not be less than the minimum numbers shown in the following table. Pair-to-Pair Far End Crosstalk (FEXT) shall not be less than the minimum numbers shown in the following table.

FREQUENCY (MHz)	PAIR-TO-PAIR NEXT LOSS (dB)	PAIR-TO-PAIR FEXT LOSS (dB)
1	65.0	65.0
10	64.0	57.0
20	58.0	51.0
31.25	54.1	47.1
100	44.0	37.0
150	40.5	33.5

7.1.3. Level 6 Hardware – Minimum Power Sum NEXT and Power Sum FEXT

Connector Power Sum Near End Crosstalk (PSNEXT) shall not be less than the minimum numbers shown in the following table. Connector Power Sum Far End Crosstalk (PSFEXT) shall not be less than the minimum numbers shown in the following table.

FREQUENCY (MHz)	POWER SUM NEXT LOSS (dB)	POWER SUM FEXT LOSS (dB)
1	65.0	65.0
10	61.0	54.0
20	55.0	48.0
31.25	51.1	44.1
100	41.0	34.0
150	37.5	30.5

7.1.4. Level 6 Hardware - Maximum Attenuation

Connector Attenuation shall not be more than the maximum numbers shown in the following table.

FREQUENCY (MHz)	ATTENUATION (dB)
1	0.04
10	0.13
20	0.18
31.25	0.22
100	0.40
150	0.49

7.1.5. Level 6 Hardware - Minimum Return Loss

Connector Return Loss shall not be less than the minimum numbers shown in the following table.

FREQUENCY (MHz)	RETURN LOSS (dB)
1 to 18	35.0
20	34.0
31.25	30.1
100	20.0
150	16.5

8. 12. CHANNEL PERFORMANCE

8.1. Scope

This section further defines the complete end-to-end channel requirements for the Levels Channel 6 solution. Channel compliance is only applicable following successful compliance to individual component Levels in this specification. This section specifies the minimum requirements that cables, connecting hardware and assembled patch cords must meet when combined into a full cabling system, in order to reach compliance with the Anixter Levels Channel Program.

8.2. Normative Reference

8.2.1. Reference Documents

The latest edition of referenced standards (from the latest available draft in the case of proposed standards) shall be the controlling document. Where the standards appear to conflict with one another, the one with the most stringent requirements shall be applicable.

?? ANSI/ICEA S-90-661
?? CSA
?? UL 444
?? ANSI/TIA/EIA-568-A
?? ISO/IEC 11801
?? CENELEC EN50173: 1995
?? NEC, NFPA70
?? NEMA WC-63/66

In addition to the requirements shown above, Level 6 cables shall previously meet the requirements of:

?? ANSI/TIA/EIA-568-A-5 (Category 5e)
?? ANSI/TIA/EIA-568-A (Category 5)
?? ISO/IEC 11801 (Category 5)

All connecting hardware and patch cords shall previously meet, as a minimum, all the requirements including the electrical and mechanical performance requirements of:

?? CSA
?? UL 1863
?? ANSI/TIA/EIA-568-A
?? ISO/IEC 11801
?? ISO/IEC 60603-7
?? CENELEC EN50173: 1995
?? NEC, NFPA70

8.2.2. Applicable Testing Standards

Testing of individual components and channel shall be conducted in accordance with the following standards:

?? ASTM D 4566-94, Standard Test Methods for Electrical Performance Properties of Insulation and Jackets for Telecommunications Wire and Cable, 1994
?? ANSI/TIAJEIA-568-A, Commercial Building Telecommunications Standard, 1995
?? ANSI/TIA/EIA-568-A-1, Propagation Delay and Delay Skew Specifications for 100 O 4-pair cable, 1997
?? ANSI/TIA/EIA-568-A-2, Corrections and Additions to TIAIEIA-568-A, 1998
?? ANSI/TIA/EIA-568-A-4, Production Modular NEXT Loss Test Method and Requirements for Unshielded Twisted Pair Cabling, 1999
?? ANSI/TIA/EIA-568-A-5, Transmission Performance Specifications for 4-pair 100 O Category 5e Cabling, 1999
?? ANSI/TIA/EIA-TSB 67, Transmission Performance Specifications for Field Testing of
?? Unshielded Twisted Pair Cabling Systems, 1999
?? ATS Anixter Test Specification ATS 01.01 for Non-Destructive Testing of Assembled Patch Cords
?? ISO/IEC 11801

This document provides required test values at specific discrete frequencies. The tabulated values are intended for reference only. All Levels products are swept-tested through a prescribed frequency range. The Anixter Levels purchase specification requires 100% compliance throughout the specified range of

frequencies tested. By convention, all values of electrical characteristics, while predominantly negative numbers (representing losses), are expressed as absolute values (positive numbers).

8.3. Requirements

8.3.1. Applicable Channels

Levels of performance apply to Berk-Tek 4-pair unshielded twisted pair cables; Ortronics assembled patch cords and Ortronics connecting hardware used with 100 ohm, 4-pair Unshielded UTP Levels Type Cables. A shielded version, if allowed, shall comply with the performance requirements of the applicable Level. The Anixter channel will consists of an equipment patch cord, information outlet, horizontal cabling (90m) with a transition point near the information outlet (I/O), two telecom closet connection points and patch cords for a total of 4 connection points, as shown below.

8.3.2. Quality Assurance

Berk-Tek and Ortronics, the manufacturers of Level cables and hardware specified herein, shall be ISO 9000 registered. Initial Qualification and Certification of the manufacturer is required. An ongoing program of random sample compliance testing of all Levels products must be maintained.

8.3.3. Level 6 Channel

8.4. Performance Requirements

8.4.1. Level 6 Channel - Highest Test Frequency

150 MHz minimum (all parameters)

8.4.2. Level 6 Channel - Minimum Pair-to-Pair NEXT and ELFEXT

Pair-to-Pair Near End Crosstalk (NEXT) shall not be less than the minimum numbers shown in the following table. Pair-to-Pair Equal Level Far End Crosstalk (ELFEXT) shall not be less than the minimum numbers shown in the following table.

FREQUENCY (MHz)	PAIR-TO-PAIR NEXT LOSS (dB)	PAIR-TO-PAIR ELFEXT LOSS (dB)
1	60.0	58.0
10	48.7	39.8
20	43.6	33.8
31.25	40.3	29.9
100	31.6	19.8
150	28.5	16.3

8.4.3. Level 6 Channel - Minimum Power Sum NEXT and ELFEXT

Power Sum Near End Crosstalk (PSNEXT) shall not be less than the minimum numbers shown in the following table. Power Sum Equal Level Far End Crosstalk (PSELFEXT) shall not be less than the minimum numbers shown in the following table.

FREQUENCY (dB) (MHz)	POWER SUM NEXT LOSS (dB)	POWER SUM ELFEXT LOSS
1	57.0	56.8
10	45.7	36.8
20	40.6	30.8
31.25	37.3	26.9
100	28.6	16.8
150	25.5	13.3

8.4.4. Level 6 Channel - Maximum Attenuation, Minimum Pair-to-Pair ACR and Power Sum ACR

Attenuation shall not be greater than the maximum numbers shown in the following table when measured at an ambient temperature of 20^0C (68^0F). Pair-to-Pair Attenuation to Crosstalk Ratio (ACR) shall not be less than the minimum numbers shown in the following table. Power Sum Attenuation to Crosstalk Ratio shall not be less than the minimum numbers shown in the following table.

FREQUENCY (MHz)	ATTENUATION (dB)	PAIR-TO-PAIR ACR (dB)	POWER SUM ACR (dB)
1	2.2	57.8	54.8
10	7.1	41.6	38.6
20	10.2	33.4	30.4
31.25	12.9	27.5	24.5
100	24.0	7.6	4.6
150	30.1	-1.5	-4.5

8.4.5. Level 6 Channel - Minimum Return Loss

Return Loss shall not be less than the minimum numbers shown in the following table.

FREQUENCY (MHz)	RETURN LOSS (dB)
1 to20	17.0
31.25	15.1
100	10.0
150	8.2

8.5. EXECUTION AND INSTALLATION

8.6. WORKMANSHIP

Components of the SCS system shall be installed in a neat, workmanlike manner. Wiring color codes shall be strictly observed and terminations shall be uniform throughout the system. Identification markings and systems shall be uniform.

8.7. GENERAL

The wiring system components of the City of Bedford shall comply with all product specifications as outlined in this RFP. All installation shall be done in conformance with TIA/EIA-568A. The SCS contractor shall ensure that the maximum pulling tensions of the specified distribution cables are not exceeded and cable bends maintain the proper radius during the placement of the facilities. Failure to follow the appropriate guidelines will require the SCS contractor to provide in a timely fashion the additional material and labor necessary to properly rectify the situation. This shall also apply to any and all damages sustained to the cables by the SCS contractor during the implementation.

A. Bonding and Grounding

Communication bonding and grounding shall be in accordance with the NEC, NFPA and the TIA/EIA-607 Commercial Building Grounding and Bonding Requirements for Telecommunications.

B. Power Separation

The SCS contractor shall not place any distribution cabling along side power lines, or share the same conduit, channel or sleeve with electrical apparatus.

C. Miscellaneous Equipment

The SCS contractor shall provide any necessary screws, anchors, clamps, tie wraps, distribution rings, wire molding (MC/ER & IC locations), miscellaneous grounding and support hardware, etc., necessary to facilitate the installation of the SCS.

D. Special Equipment and Tools

It shall be the responsibility of the SCS contractor to furnish any special installation equipment or tools necessary to properly complete the SCS. This may include, but is not limited to, tools for terminating cables, testing and splicing equipment for copper/fiber cables, communication devices, jack stands for cable reels, or cable wenches.

E. Labeling

The SCS contractor shall be responsible for providing and installing printed labels for all cables and cords, distribution frames, equipment racks and outlet locations, according to the City of Bedford's specifications at the time of delivery. No labels are to be written by hand.

F. Cable Storage

The SCS contractor shall not roll or store cable reels without an appropriate underlay and the prior approval of the City of Bedford and/or Project Manager.

8.8. SUBSYSTEMS

The SCS shall consist of the following subsystems:

- ?? Work Area Subsystem
- ?? Horizontal Subsystem
- ?? Vertical Subsystem
- ?? Equipment Subsystem
- ?? Administration Subsystem

8.9. SUPPORTED SYSTEMS

The system shall support analog and digital voice applications, data, local area networks (LAN), video and other various low voltage devices on a common cabling platform.

8.10. WORK AREA SUBSYSTEM

The Work Area Subsystem provides the connection between the TO and the station equipment. In the Work Area, TO are located and terminated on the end of the horizontal cable that provides modular connectivity to a single point device. The Work Area subsystem consists of patch cables and/or adapters. The SCS contractor shall provide and install this interface where required and/or directed. It shall be the responsibility of the SCS contractor to properly terminate all horizontal cables at the device.

A. The SCS contractor shall supply, install and label the wiring that connects the work area devices to information outlets. This includes patch cables and/or connectors. The SCS contractor shall place the patch cables in the outlets designated by the City of Bedford and label the cables on both ends with the outlet number.

1. The patch cable will be used for data requirements. The SCS contractor shall supply, install and label two (2) factory assembled 9-ft patch cables for every quad location in the building. The SCS contractor shall also supply install and label one (1) factory assembled 9-ft patch cable for every double location in the building.

8.11. HORIZONTAL SUBSYSTEM

The Horizontal Subsystem provides connections from the horizontal cross connect to the information outlets in the work areas. It consists of the telecommunications outlets in the work area, horizontal transmission media, cross-connect hardware, jumpers and patch cables in the wiring closets. All cabling provided by the SCS contractor shall consist of 24 -AWG unshielded twisted pair and be wired in a star configuration from the TC to the TO locations. All horizontal cabling shall be plenum rated. Any exceptions to the use of this cabling by the SCS contractor must a) be proven electrically incompatible, or b) in violation of local codes or standards, and be documented in writing by the contractor. It is imperative that the SCS be designed to create a fully operational system without any restrictions, and provide maximum flexibility for future use. For this reason, it is the City of Bedford's preference to utilize power-limited low voltage cabling and devices whenever possible, unless it is technically or economically impractical.

The entire Fire Department building will be served by Telecommunications Closet *#4* (Room Fl19) located in the Fire Department. The entire City Hall building will be served by Telecommunications Closet #3 (Room C132A) located in the City Hall. The upper level of the Justice Center will be served by Telecommunications Closet #2 (Room 201A) located on the second floor. The basement level and the area designated as Police Department (excluding the detention facility) on the main level will be served by Telecommunications Closet #1 located on the main level in the Police Department (Room P131). The remainder of the Justice Center including the Detention Facility will be served by the Main Computer Room (Room J112) located on the main level of the Justice Facility.

The SCS contractor shall provide and install all modular cords required in the MC and TC1-4.

It is the responsibility of the SCS contractor to ensure that any necessary cable support materials and pathways (conduit, cable tray, raceway, cable rings, etc.) required to support the horizontal cabling is to be provided and installed.

A. Horizontal Cabling

1. The SCS contractor shall supply horizontal cables to connect each information outlet to the vertical subsystem.

2. Unless otherwise noted on the floor plans or within this document and/or the attached documents, the type of horizontal cables used for each horizontal cable run shall be 4-pair unshielded twisted pair (UTP) using Berk-Tek-350 Level 6 cable.

3. The horizontal cables shall be run using a star topology, from the wiring closet to every individual information outlet. All cable routes to be approved by the City of Bedford and/or the Project Manager prior to installation of the cabling.

4. The length of each individual run of horizontal cable from the wiring closet to the information outlet shall not exceed 295-ft (90m).

5. The SCS contractor shall observe the bending radius and pulling strength requirements of the UTP cable during handling and installation.

6. Each run of cable between the termination panel/block and the information outlet shall be continuous without any joints or splices.

7. In suspended ceiling and raised floor areas where duct, trays or conduit are not available, the SCS contractor shall bundle station wiring with plenum cable ties at 5-foot distances. The cable bundling shall be supported via "J" hooks and/or rings and attached to the existing building structure and/or framework. Plenum cable will be used in ALL areas.

8. If the interior of building walls are not obstructed, the SCS contractor shall conceal horizontal distribution wiring internally within the walls. If such obstructions exist, the SCS contractor shall secure approval of the City of Bedford prior to the use of an alternate method.

9: Every effort will be made to schedule the requirements under this RFP in such a manner so as to complete all above ceiling work prior to ceiling installation. In the event the SCS contractor is required to remove ceiling tiles, such work shall not break or disturb grid and/or tile and must be coordinated with the Project Manager.

10. Cables installed within ceiling spaces shall be routed through these spaces at right angles to electrical power circuits.

11. There shall be approximately (127) work area locations that will have four (4) runs of horizontal cable, placed in home run fashion from the location to the designated wiring closet. There shall be no intermediate splices or cross-connects in these cables. It is however, the SCS contractor's responsibility to verify exact horizontal quantities.

12. There shall be approximately (66) work area locations that will have two (2) runs of horizontal cable, placed in home run fashion from the location to the designated wiring closet. There shall be no intermediate splices or cross-connects in these cables. It is however, the SCS contractor's responsibility to verify exact horizontal quantities.

13. There shall be approximately (41) work area locations that will have one (1) run of horizontal cable, placed in home run fashion from the location to the designated wiring closet. There shall be no intermediate splices or cross-connects in these cables. It is however, the SCS contractor's responsibility to verify exact horizontal quantities.

14. The horizontal patch panels shall be 48-port and 96-port Modular to 110 Patch Panels PCB Version Level 6.

B. Patch Cables

1. Copper

a. Patch cables shall be installed in the racks in the MC and TC1 for the connection of the horizontal cabling to equipment and/or vertical cabling. The patch cables will be used for voice and data requirements.

b. The SCS contractor shall supply and install (2) patch cables (of varying lengths) for every quad and double location in the building, and (1) patch cable (of varying length) for every single location in the building.

C. Work Area information outlets

1. Each work area location receiving four (4) cables will be terminated with four (4) Ortronics GIGAMO+ TracJack Modules. Beige single gang faceplates, modular furniture bezels, or surface mount boxes shall be used to complete the installation. Any open spaces on faceplates shall be fitted with blank modules.

2. Each work area location receiving two (2) cables will be terminated with two (2) Ortronics GIGAMO+ TracJack Modules. Beige Single gang faceplates, modular furniture bezels, or surface mount boxes shall be used to complete the installation. Any open spaces on faceplates shall be fitted with blank modules.

3. Each work area location receiving one (1) cable will be terminated with one (1) Ortronics wall phone plate.

8.12. VERTICAL SUBSYSTEM

The main cable route within a building is called the Vertical Subsystem. It links the main cross connect (MC) to the horizontal cross connects in the telecommunications closets (TC1-4) and/or other special purpose rooms. It consists of the vertical transmission media between these locations, cross connect hardware, jumpers and patch cables in the wiring closets. It is normally installed in a star topology, with first-level vertical cables beginning in the main cross connect. All vertical cabling shall be tested by the SCS contractor. Multi-pair copper vertical cabling shall be supplied and installed by the SCS contractor and shall provide connectivity from the MC to the TC (1-4) and the Phone Rooms. Multi-mode and single mode fiber optic vertical cabling will also be supplied and installed by the SCS contractor. All vertical (indoor) cabling shall be plenum rated. Any exceptions to the use of this cabling by the SCS contractor must a) be proven electrically incompatible, or b) in violation of local codes or standards, and be documented in writing by the contractor. It is imperative that the SCS be designed to create a fully operational system without any restrictions, and provide maximum flexibility for future use. For this reason, it is the City of Bedford's preference to utilize power-limited low voltage cabling and devices whenever possible, unless it is technically or economically impractical.

The SCS contractor shall provide and install all patch cords and jumpers required in the MC and TC (1-4).

A. The vertical subsystem shall include vertical runs of intra-building and inter-building cable between wiring closets. All cable routes to be approved by the City of Bedford and/or the Project Manager prior to installation.

B. Adequate vertical sleeve/slot space may be available in all TCs such that no drilling of additional sleeves is necessary. It is however the SCS contractor's responsibility to verify pathways and access.

C. The SCS contractor shall run the vertical cables in a star topology from the MC.

D. There shall be 50 pairs of copper vertical cabling run from the MC to TC1. There shall be 50 pairs of copper vertical cabling run from the MC to TC2. There shall be 100 pairs of copper vertical cabling run from the MC to TC3 where 60 pairs will terminate and 40 pairs will continue to TC4. There shall be 100 pairs of copper vertical cabling run from the MC to the Telephone Room.

E. In the MC and TC1-4, the copper vertical cabling shall be terminated with Category 5e rack mounted patch panels. Each panel port shall be terminated with two (2) pairs of vertical cabling. In the Telephone Room, the copper vertical cabling shall be terminated onto wall mounted 110 blocks.

F. There shall be twelve (12) strands of multi-mode fiber vertical cabling run

from the MC to TC 1-4. There shall be twelve (12) strands of single-mode fiber vertical cabling run from the MC to TC1-4.

G. There shall be twelve (12) strands of multi-mode fiber vertical cabling run from the MC to TC2. There shall be twelve (12) strands of single-mode fiber vertical cabling run from the MC to TC1-4.

H. All fiber cabling is to be installed in innerduct, end-to-end, regardless of environment.

I. All fiber vertical cabling shall be terminated with rack mount panels with SC connectors. Open spaces in the fiber panels shall be fitted with a blank module.

J. Patch Cables

1. Copper

a. Patch cables shall be installed in the racks in the MC. The patch cables will be used for the connection of the vertical copper cabling from TC 1-4 to the copper cabling from the Telephone room. The patch cables will be used for voice requirements.

b. The SCS contractor shall supply and install one (1) patch cable (of varying lengths) for every quad and double TO location, and one (1) patch cable (of varying lengths) for every single TO location.

2. Fiber

a. The SCS contractor shall supply and install (2) duplex fiber patch cables for every two (2) strands of fiber installed for both multi-mode and single-mode fiber.

8.13. EQUIPMENT SUBSYSTEM

The Equipment Subsystem consists of shared (common) communications equipment in the main cross-connect, equipment room or telecommunications closet. The Equipment Subsystem provides miscellaneous equipment and/or devices. It allows other equipment to be installed with a distributed or centralized approach. In addition, it allows for equipment to be easily replaced or upgraded in the future. The equipment is to be provided and installed by the SCS contractor. The SCS contractor shall work in cooperation with other vendors to verify exact placement before the installation of the equipment. The layout and designation of the equipment is to be mutually agreed upon by the SCS contractor and other related contractors. Final approval for the layout and designation of the equipment shall reside with the City of Bedford and/or the Project Manager.

A. The SCS contractor shall supply and install all rack hardware and associated equipment as designated on the attached drawings and/or necessary to complete a SCS.

B. Bonding and Grounding

The SCS Contractor shall provide a #6 AWG stranded copper wire cable between ground bars located at the MC, TC1-4 and the building main service ground point. The ground conductor shall be utilized for equipment, termination, equipment rack and computer equipment grounding. Communication bonding and grounding shall be in accordance with the NEC, NFPA and the TIA/EIA-607 Commercial Building Grounding and Bonding Requirements for Telecommunications.

8.14. ADMINISTRATION SUBSYSTEM

The Administration Subsystem links all of the subsystems together. It consists of labeling cabling, hardware, and equipment for providing system identification. The administration subsystem shall consist of labels, plates, and other identification materials. All labeling schemes shall be approved by the City of Bedford prior to installation. All components required for the Administration Subsystem shall be provided and installed by the SCS contractor. All cable path and cross connect engineering/records required to document electrical continuity shall be provided by the SCS contractor, and shall be subject to approval by the City of Bedford. In addition, all labeling for the pathways, cables, cross-connect blocks, and outlets are to be provided and installed by the SCS contractor. All labeling shall be in accordance with TIA/EIA-606, Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.

8.15. DAMAGES

The SCS contractor will be held responsible for any and all damages to portions of the building caused by it, its employees; including but not limited to:

A. Damage to any portion of the building caused by the movement of tools, materials or equipment.

B. Damage to any equipment of the construction of spaces “turned over” to the SCS contractor.

C. Damage to the electrical distribution system and/or other space “turned over” to the SCS contractor.

D. Damage to the electrical, mechanical and/or life safety or other systems caused by inappropriate operation or connections made by the SCS contractor or other actions of SCS contractor.

F. Other damage to the materials, tools and/or equipment of the City of

Bedford, its consultants, Project Manager, subcontractors, Architect, other contractors, agents and leasees.

8.16. PENETRATION OF WALLS FLOORS AND CEILINGS

A. The SCS contractor shall make no penetration of floors, walls or ceiling without the prior consent of the Architect and/or the Project Manager.

B. Where penetrations through acoustical walls or other walls for cable pathways have been provided for the SCS contractor such penetrations shall be sealed by the SCS contractor in compliance with applicable code requirements and as directed by City of Bedford's Architect and/or the Project Manager.

C. Where penetrations through fire-rated walls for cable pathways have been provided for the SCS contractor, such penetrations shall be sealed by the SCS contractor as required by code and as directed by the City of Bedford's Architect and/or the Project Manager. SCS contractor shall, prior to the commencement of on-site activities, submit to City of Bedford for review by its Architect, details of any special systems to be used.

8.17. ON SITE SUPPORT

A. Technical Support

The SCS contractor will provide one (1) person for post-installation, on-site technical support. The support will be provided for a duration of forty (40) hours. The City of Bedford shall deem when the support hours will be provided. The personnel providing technical support will:

1. System Knowledge
   Have intimate knowledge of the system.

2. Material
   Be skilled at all equipment and materials used under the Contract.

3. Troubleshooting
   Be competent to troubleshoot and fix problems associated with SCS contractor provided materials.

8.18. PROJECT DIRECTION

A. Single Point of Contact

SCS contractor will provide a single point of contact, i.e., Project Manager, to speak for the SCS contractor and to provide the following functions:

1. Initiate and coordinate tasks with the City of Bedford, its Project Manager, Architect, and others as specified by the City of Bedford.

2. Provide day-to-day direction and on-site supervision of SCS contractor personnel.

3. Ensure conformance with all Contract provisions.

8.19. TESTING

A. Copper Cable Testing

100 percent of the horizontal and vertical wiring shall be tested and verified in good working condition.

1. Horizontal Cable Testing

Horizontal Wiring pairs shall be tested from the information outlet to the IC. The horizontal runs designated as wall phones shall be tested for continuity. The Category 5 cable runs shall be tested for conformance to the specifications of EIA/TIA 568-A Category 5.

2. Vertical Cable Testing

Vertical wiring pairs shall be tested from end to end for continuity.

3. SCS Contractor Responsibility

Any cables not testing properly shall be corrected by the SCS contractor, at no charge to the City of Bedford. Complete, end to end, test results for everything must be submitted to the City of Bedford in hard and soft copy formats.

B. Optical Fiber Cable Testing

Fiber testing shall be performed on all fibers in the completed end to end system. Testing shall consist of a bi-directional end to end power meter test.

1. Pre-installation cable testing

The SCS contractor shall light test all fiber cable prior to installation. The SCS contractor shall assume all liability for the replacement of the cable should it be found defective at a later date.

2. SCS Contractor Responsibility

Any cables not testing properly shall be corrected by the SCS contractor, at no charge to the City of Bedford. Complete, end to end, test results for everything must be submitted to the City of Bedford in hard and soft copy format.

C. Test Equipment

All testing shall be done with a WireScope 155 that is equipped with software version 5.0.

1. SCS Contractor Responsibility

Any cables not testing properly shall be corrected by the SCS contractor, at no charge to the City of Bedford. Complete, end to end, test results for everything must be submitted to the City of Bedford in hard and soft format.

8.20. WARRANTY

A. Manufacturer Warranty

The SCS contractor shall provide a twenty-five (25) year Ortronics Extended Product Warranty and System Assurance Warranty for this cabling system.

B. Additional Warranty

The SCS contractor shall state any additional SCS contractor supplied warranty.

8.21. COMPLETION OF WORK

At the completion of the System, the SCS contractor shall restore to its former condition, all aspects of the project site and on a daily basis, shall remove all waste and excess materials, rubbish, debris, tools and equipment resulting from or used in the services provided under this Contract. All clean up, restoration, and removal noted above will be by the SCS contractor and at no cost to the City of Bedford. If the SCS contractor fails in its duties under this paragraph, the City of Bedford may upon notice to the SCS contractor perform the necessary clean up and deduct the costs thereof from any amounts due or to become due to the Contractor. The City of Bedford, through its Project Manager will provide a dumpster for the use of the SCS contractor. It shall be the SCS contractor's responsibility to remove trash from the areas it is working in and bring trash and debris to the dumpster. The SCS contractor will not use the Project Manager's dumpsters or trash disposal without prior approval of the Project Manager.

8.22. TRAINING

The SCS contractor shall provide one (1) person for eight (8) hours to train the responsible representative(s) of the City of Bedford on the proper use, handling, and maintenance of the SCS. The day and time is to be determined by the City of Bedford. The SCS contractor shall also provide written training materials for the SCS.

8.23. INSPECTION

On-going inspections shall be performed during construction by representatives of the City of Bedford and/or the Project Manager. All work shall be performed in a high quality manner and the overall appearance shall be clean, neat and orderly. Once the project is complete, the City of Bedford will have a final inspection to ensure that all of the RFP requirements have been provided.